CHARGED PARTICLES FROM NUCLEAR REACTIONS INDUCED BY MEDIUM ENERGY PROTONS

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Charged particle spectra have now been taken from a number of targets bombarded by 162 MeV protons. Counter telescopes are used to identify the particles and measure their energy. All of the data to date has been taken with silicon detectors and, therefore, while the complete energy range has been covered for particles with $Z \geq 2$, only the region $\lesssim$ 50 MeV has been studied for protons, deuterons, and tritons. A run using a NaI(Tl) detector thick enough to stop the most energetic protons is scheduled for the near future.

Fig. 1a shows the alpha particle spectrum obtained at 20° with a ^{62}Ni target. Particles are present all the way up to about 150 MeV with the low energy region dominated by an evaporation peak. Only below about 20 MeV can most of the yield be attributed to evaporation. The ^{3}He yield, Fig. 1b, is similar at the higher energies but shows no evaporation peak. The alpha spectrum from an ^{27}Al target, Fig. 1c, is similar to that from a ^{62}Ni target, except that the evaporation spectrum peaks at a lower energy, as is to be expected from the lower coulomb barrier. Finally, the alpha spectrum at 100° from the ^{62}Ni target, Fig. 1d, shows much less of a high energy tail, thus confirming the non-statistical origin of the high energy particles. It should be noted that there was a low energy cutoff when this latter spectrum was taken so that the full evaporation peak is not observed.

Much of the data is still preliminary, particularly in so far as absolute cross sections are concerned. Significant numbers of heavy ions, Z>2, have been observed and their spectra are presently being sorted out. When all of the particle spectra have finally been determined the results will be compared to those obtained with lower energy protons and with other bombarding particles, particularly pions. Comparison will also be made to some of the few theoretical predictions that have been made for reactions in this energy region.

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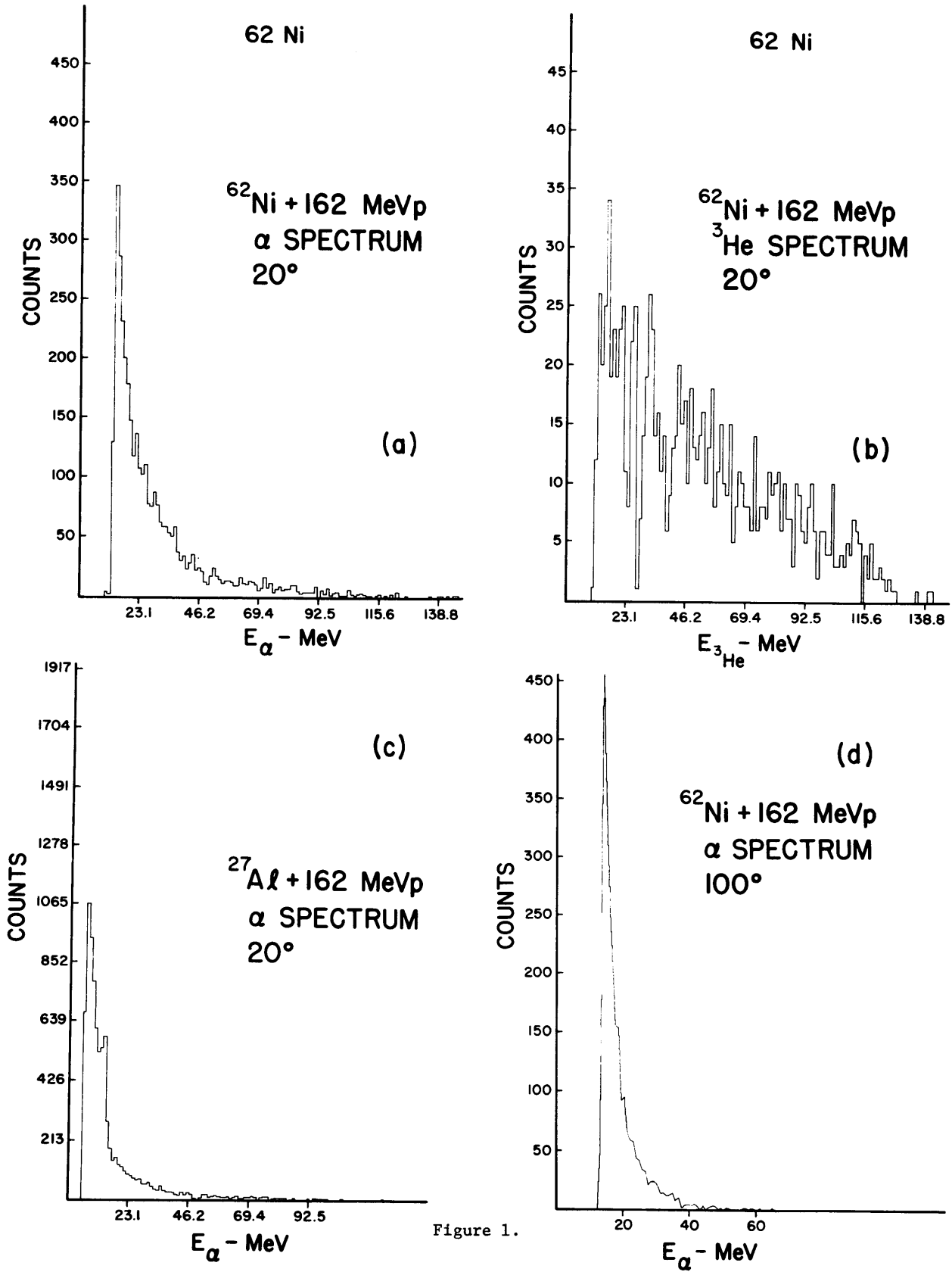
62 Ni
^{62}Ni + 162 MeVp
α SPECTRUM
20°
(a)
COUNTS
E_α - MeV
62 Ni
^{62}Ni + 162 MeVp
^{3}He SPECTRUM
20°
(b)
COUNTS
$E_{^3He}$ - MeV
^{27}Al + 162 MeVp
α SPECTRUM
20°
(c)
COUNTS
E_α - MeV
^{62}Ni + 162 MeVp
α SPECTRUM
100°
(d)
COUNTS
E_α - MeV

Figure 1.